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NOTICES

OF

The Aëronautical Society.

At a meeting of the Aëronautical Society held at the Society of Arts, John Street, Adelphi, the following gentlemen were elected members of the Society:—

DR. WILLIAM NAPIER SHAW, F.R.S.

MR. FREDERICK JOHN MELVILLE.

The following gentleman was elected a member of the Council:—

DR. WILLIAM NAPIER SHAW, F.R.S.

On Monday, July 21st, when Major B. F. S. Baden-Powell arrived at the Victoria Barracks, Windsor, in command of the time-expired men and reservists of the Scots Guards, he was met by a deputation from the Council of the Aëronautical Society of Great Britain, who presented him with an illuminated address as follows:—

To MAJOR B. F. S. BADEN-POWELL, Scots Guards, President of the Aëronautical Society of Great Britain.

We, the undersigned, members of the Council of the Aëronautical Society of Great Britain, offer to you our sincere congratulations on your safe return from the war in South Africa, and, as we trust, in the best of health.

It is a source of much gratification to us to know that in your absence from our Council you have carried out such useful and successful experiments with your military kites.

It is with very great pleasure that we welcome you home.

(Signed),

EDWIN ARNOLD.
EDWARD BARRY.
CRAWFORD.
LESLIE M. EARLE.
EDWARD P. FROST.
JAMES GLAISHER.
HIRAM S. MAXIM.
H. C. ROBERTS.
CHARLES WARREN.
ERIC STUART BRUCE,
Honorary Secretary.

The opening meeting of the new session of the Aëronautical Society of Great Britain will be held at the Society of Arts, John Street, Adelphi, early in December, when Major B. F. S. Baden-Powell, Scots Guards, the President of the Society, will take the chair, and deliver an address on "Recent Aëronautical Progress."

There will also be papers on :—

"The Contributions of Balloon Investigations to Meteorology," by Dr. William Napier Shaw, F.R.S., and "The Kite Equipment of the Scottish National Antarctic Expedition," by Mr. John Anderson (with Lantern Illustrations).

Due notice will be given of the exact date of this meeting.

INTERNATIONAL KITE COMPETITION.

There will be an International Competition for the Highest Kite Flight under the auspices of the Aëronautical Society of Great Britain next year. The award will be the silver medal of the Society. Full particulars will be announced in the January number of this Journal.

CHANGE OF ADDRESS OF THE AËRONAUTICAL SOCIETY OF GREAT BRITAIN.

Members of the Aëronautical Society of Great Britain and others are reminded that the new address of the Society is

53, Victoria Street,
Westminster,
London, S.W.,

where will be the Office and Library of the Society. All communications should be addressed to the Honorary Secretary at that address.

After the Library has been duly catalogued and put into order at the new premises, arrangements will be made for it to be open to members on stated days for reference, due notice of which will be given.

ERIC STUART BRUCE,
Honorary Secretary.

GENERAL MEETING.

The concluding meeting of the Session of the Aëronautical Society of Great Britain was held at the Society of Arts, John Street, Adelphi, on Thursday, July 17th. Mr. E. P. Frost, J.P., was in the chair.

On the platform was the Brazilian Minister accompanied by the whole staff of the Brazilian Legation.

The Chairman: Ladies and Gentlemen,—I am sure we are all very pleased to hear such gratifying reports of our King, and delighted to hear that our President, Major Baden-Powell, is expected home very shortly; and I need, at the present moment, only call upon the Honorary Secretary to read the minutes.

The Honorary Secretary read the minutes, and announced the receipt of several messages, telegrams, and letters of regret from those unable to attend the meeting. Amongst these names were Lieut.-General Sir Charles Warren, Sir William Crookes, Sir Hiram S. Maxim, Major H. C. Roberts, Lieut.-Colonel Templer.

The Chairman, in calling upon the Honorary Secretary to read the first paper, announced that the Brazilian Minister had honoured the meeting with his presence that evening. (Applause.)

He remarked that the paper on "The Peace Balloon of the late Senhor Augusto Severo," by Dr. Carlos Sampaio, had been put into the hands of the Honorary Secretary by the Brazilian Minister only a few days before the fatal accident to Senhor Augusto Severo.

The "Peace" Balloon of the late Senhor Augusto Severo.

I.—By DR. CARLOS SAMPAIO.

The conquest of the air, by solving the problem of the direction of balloons, is the subject of the present day; and its solution will be the indispensable complement of the problem of mechanical locomotion.

If, in the 20th century, the problem of mechanical locomotion was solved in the most simple case, that of linear locomotion, or at one dimension, constituted by all the means of transport in railways of whatever nature, where, whether by steam or by electricity, velocities over 100 kilometres per hour were attained; if, also, astonishing results were obtained in the case of plane locomotion or at two dimensions, whether terrestrial, by means of automobiles which have already developed velocities of over 60 kilometers per hour, or

maritime by means of large steamers having velocities of over 20 knots per hour; the 20th century seems to reserve us the surprise of furnishing the solution of the more difficult case—that of locomotion in space or at three dimensions, whether maritime, by means of submarines, which, when submerged, have a velocity of eight knots per hour, or aerial, by means of balloons, which, by the experiments of Santos Dumont, can have a velocity of 8m. 50 per second, *i.e.*, 30.600m per hour.

As may be seen, however, the final result in the last point is not yet obtained, as great velocity is required to oppose the wind, whose

THE LATE SENHOR SEVERO.

force, often enough, is equal to 15m. per second, or 54km. per hour.

We do not know what velocity will be reached by the system of which we are now to treat, but we are far from believing that a speed of 25 metres per second, which we are promised by its author, will be attained. Whatever the defects and inconveniences, however, of this system, the inventor proposes to himself the realisation of two ideas, which, by themselves, form an important progress in aërial navigation.

These ideas for which we have contended in various articles, we have written on the subject, are of vital interest for the solution of the problem.

(a.) The coincidence of the centres of traction and resistance, not only to avoid wavering, in order to annul the perturbing couple, but also to use in a better way the motor's force which is *all* employed in producing the propulsion, instead of being *partly* distracted to produce rotation.

(b.) To form but one body of balloon and boat, so as to propel only one single system, instead of two joined by flexible intermediaries, which was the case in balloons hitherto constructed.

In his romance, "Five Weeks in a Balloon," Jules Verne already said (page 58), "It would be necessary to discover a motor of an extraordinary power, and of an impossible lightness. And yet we shall not be able to resist winds of any importance. Hitherto people have occupied themselves rather in *directing the car than the balloon*. This is a mistake."

An invention, however, is characterised not by the idea, but by its realisation, and without doubt the idea of placing the propeller in the body of the balloon already presented by several authors (Farcot in 1859, Smitter in 1866, Micciolo Picasse in 1871, Cordenous in 1875, Capt. Danrit in "War in Balloon"), as well as that of building balloon and boat in one single system, suggested by us in 1895, are for the first time, really put in practice by Senhor Augusto Severo. It is not easy to give a description of this system, which is quite original, and completely different from all until now constructed, but we may be allowed to present a conception easily to be conceived by those who never saw it.

Let us imagine a melon from whose lower part a slice has been cut out (a solid of revolution with the spindle extracted), and we have the exact form of the envelope intended to contain the hydrogen which produces the ascensional force.

The slice is substituted by a boat made of bamboo, and ending into a dihedral angle in its upper part, so that the apex of the angle coincides with the largest axis of the balloon, which is the axis of rotation of two propelling screws placed at the stern and prow respectively. The driving force is furnished by two petroleum engines (Buchet system) of 16 and 24 horse powers. The propeller at the stern is six meters of diameter, and that of the prow of a smaller one, four meters, the latter having the form of two wings whose purpose is to suck in the air, and so diminish the pressure on the walls of the balloon.

Besides these, we find a propeller *in* the boat, really a compensating screw, for maintaining the airship in an horizontal position,

or to determine better the coincidence of the centres of propulsion.

In substitution to a rudder the author places two transversal propellers beneath the balloon's longitudinal axis at the two ends of the boat; when acting, either separately, or combined in opposite directions, they cause gyration of the system round a vertical axis which passes throuh the centre of mass; but when working simultaneously in the same direction, they are supposed to impede the lowering of the balloon, which may be produced by a lateral wind. The envelope of the balloon is 30 meters long, and 12 ins. diameter, holding 2,000 cubic meters of gas; it is of unsymmetrical form, broader at the prow than at the poop; and has at each side of the boat two compensating ballonets as generally used in dirigible airships.

The motor's engines are protected by a metallic cover. Davy's lamp system is here, for the first time, employed in aerial navigation.

It is as easy to recognise the absurdity of certain ideas about aërial navigation, as it is difficult to foresee the results of a new rational system of airshipping, aërial locomotion being a science that has not yet the complete sanction of practice. It is, using the theories until now established, supported by mechanical laws, that we shall venture to enumerate the qualities we consider defects in the present system.

First, the boat, which otherwise forms a notable originality is too heavy, the inventor having overlooked the essential quality in aërial navigation, that of extreme lightness. Also as regards resistance, much is to be desired, principally in relation to the flexibility.

Second, the diameter of the balloon (12 metres), is excessive, and the formula $T = K.A.V.3$, where T. represents the work, K., a practical co-efficient equal to .025, but whose exact value is still to be determined, A., principal section of the balloon, and V. its velocity, shows that Senhor Severo, though his balloon is fitted with two engines, will never be able to attain a velocity superior to 11 meters per second; but even this would be a very good result.

In the third place, we fear that the employment of two propelling screws are rather at a disadvantage, similar to the action of two railway engines, placed at the two ends of a same train. We observe, by the way, that the diameter of the propellers is unproportional to the diameter of the airship.

What most, however, preoccupies our mind, is the complete absence of resistance to flexibility which presents the edge of the boat's framework, from the longitudinal axis of the balloon. Given the case that, as generally happens, the wind is blowing in gusts, and, therefore, constantly changing the magnitude of its force; it is very probable that, in this event the framework could never resist to the bending force produced, especially when, besides this, by the action of lateral screws, the balloon should oppose the wind on the side.

Finally, we consider the omission of the rudder a mistake, because it has always the most effective way of directing submerged bodies in fluids. The chief object is not to oblige the airship to make large revolutions, but to bring it back into its original direction, when deviated by accidental causes. Our opinion is that we must obtain the least superficie with the greatest sensibility, for which the rudder should be placed at the poop of the balloon, behind the propeller screw, in order to take advantage both of the natural air-current, caused by the displacement of the balloon, and of the artificial current, produced by repulsion due to the propellers' motion.

We think, therefore, that the substitution of the rudders by the two transversal propellers is an unhappy one, particularly when their axes are placed considerably below the balloon's longitudinal axis. It is difficult to understand that Senhor Augusto Severo, who makes so great a question of the coincidence of the centre of traction with that of propulsion, should have forgotten that it is necessary to consider the same condition when treating with lateral displacements, whether to prevent pitching, or to revolve the system on itself; for the very same reason that the propelling screws should be placed so that the direction of propulsion should pass through the centre of resistance, the directing screws should have their axes on the horizontal plane of the balloon passing through the centre of lateral resistance.

It being generally accepted that the whole motive force should be employed in the propulsion, why, then, distract a part to obtain direction? Notwithstanding our different conception of several details we have the greatest desire to see Senhor Severo's efforts crowned with success. Whatever might be the results of his experiments, he is the first to have adopted a system in which balloon and boat form one single body, and in which the propulsion is effected in the most convenient place; this is enough to ensure Senhor Severo

a brilliant place in the history of aërial navigation.

II.—By ERIC STUART BRUCE, M.A.

The Greek Philosopher Aristotle, in no portion of his great ethical treatise showed more conclusively his profound knowledge of human nature than in those sentences by which he describes the difficulty of man in preserving the mean. If the balloon "La Paix" had successfully accomplished its projected course of 18,000 metres from the Parc D'Aërostation at Vangirard, to the Champs De Manœuvres at D'Issy, the world would have resoundel with the praises of Senhor Augusto Severo, and the wave of popular enthusiasm set in motion by the aërial feat of M. Santos Dumont would have been redoubled in its force. But in aërial experiments it is often a hair's-breadth which separates success and failure, life and death. In the martyrdom of Senhor Augusto Severo and M. Georges Sachet for the cause of science, once again the attention of the world has been drawn to the dangers braved by those who attempt the mastery of the air, once again has a depression fell upon aëronautical enterprise, once again the sceptic shakes his head and says, to what purpose is this waste of human life?

But Science does not measure progress by the deceptive scale of a momentary success or failure. It regards both from the only safe point of view—the Aristotelian mean.

It seems, therefore, fit, that on the occasion of the universal consternation, that the destruction of "La Paix" has aroused, a Society which devotes itself to the scientific consideration of aërial topics should point out that if Senhor Severo failed in his attempt there was, at any rate, one vital point in his system which cannot be obscured even by the intense horrors of the disaster, and is destined to arise from the ashes of the ill-fated aircraft.

It is now for others to seek to apply that vital point in a way that will not be dangerous. That point to which I refer is the one already emphasised in Dr. Carlos Sampaio's paper, which has just been read to you, viz., the combination of balloon and car in one symmetrical body, so that the propeller may be placed in the position to propel the whole system.

Such a system, however, necessitates the adoption of a very small space between the car and the balloon proper, and for this reason the presence of petroleum motors in the car cannot fail to be dangerous. The proximity of the motors to the borderland of the great mass of gas, the distance being not above a metre, was, indeed, the cause of the fiery end of Senhor Severo's balloon. For it is the borderland which is the place of danger where there are oxygen atoms to combine with the hydrogen atoms. I take this inverted jar of hydrogen and plunge a lighted taper into it. The hydrogen takes fire at the mouth of the jar, but the taper goes out when I thrust it upwards into the jar. (Experiment shown.) Hydrogen gas takes fire under certain conditions, but is incapable, of itself, supporting combustion. The flame you have just seen burning at the mouth of the jar is the effect of the great affinity which exists between the atoms of hydrogen and the atoms of oxygen, which latter, in the atmosphere of this room border upon the hydrogen of the jar. Further up in the jar the hydrogen atoms have no oxygen atoms wherewith to combine. The presence of flame or electric sparks on a balloon near the borderland, where there may be an escape of hydrogen either through automatic valves, or even through the material of which the balloon is made, must be an element of danger. I fill this soap bubble with gas, and when it is rising apply a flame to the dangerous borderland. There is a conflagration of the miniature balloon. (Experiment shown.) I cause electric sparks to come in contact with the soap film and we have another conflagration. (Experiment shown.) These simple experiments emphasise the danger of the borderland. It is a fact not, perhaps, generally appreciated, that a little beyond the dangerous borderland inside a balloon where there are no oxygen atoms we might leave a red-hot poker with impunity. Here I have a glass globe through which a continuous stream of coal-gas is passing. You see this must be so for I have ignited the gas jet coming from this globe. I have stretched a little piece of platinum wire across the terminals of an electric battery and placed these terminals inside the globe. Now I will cause the electric current to pass through the piece of wire and it becomes red hot with impunity. (Experiment shown.) Again, though an electric spark at the borderland is a source of danger, it can exist harmlessly when the borderland is passed. Here I have a naked electric discharge sparking away harmlessly in the centre of another globe filled with coal-gas. Senhor Severo had intended to apply the Davy lamp principle to his balloon, and surrounded his motor with wire gauze, but from some reason this precaution was omitted. It is, however, likely that the application of

the Davy lamp principle to a navigable balloon would be fallacious, as it is well-known that the Davy lamp principle does not act under pressure. Such pressure, however, would be often afforded in the case of a navigable balloon by the air current.

As it is clear that it is dangerous to employ petroleum motors in close proximity to the balloon, it is also clear that if the grand idea of propelling balloon and car in one body is to survive its inventor other safer means of deriving motive power for the screws will have to be adopted. It would seem that for such a combination there is, according to present knowledge, only one safe means of obtaining power—that is electricity.

It will at once be urged that, with electricity, it is impossible to obtain sufficient power for the screw owing to the weight of the battery, whether primary or secondary. To this I would reply, supply is regulated by demand. Let aëronauts demand from electricians a sufficiently light and portable battery to provide power to combat light winds, and the supply will be forthcoming.

It must be remembered that in 1885 Captains Krebs and Renard experimented with their navigable balloon "La France" in which the motive power was derived from electricity, and navigated their balloon against a wind of 3½ metres a second.

Since that time batteries have improved in both efficiency and portability. At that time such an excellent device as the ever ready dry battery by which we can obtain an electric light at will would have been thought an impossibility.

It was Sir Hiram Maxim who, when devising his celebrated aëroplane flying machine, first set the example of making a steam boiler of extraordinary lightness for the power developed.

In the words of our President, Major Baden-Powell, "No one, before this was constructed, could have believed in the practicability of making a steam engine of 300-horse power and placing it in a flying machine presenting some thousands of square feet of surface to the air, the whole apparatus only weighing some three tons." Let some chemist or electrician turn his whole attention for a while to produce an electric battery which will be like the steam engine of Sir Hiram Maxim, a miracle of lightness and efficiency, and he will have given a large impetus to aëronautical science and transformed the dreams of the lamented Brazilian aëronaut into a possibility.

Bearing in mind the experiments I have shown you, emphasising the possibility of red hot wire and naked electric sparks in the interior of a gas balloon, perhaps, in the future, that spot may be chosen for the position of the batteries and motors in airships.

In showing on the screen the portrait of Augusto Severo, I will say just a few words about the personality of the illustrious Brazilian who, with his engineer, perished on May 11th, in the cause of Science and Cosmopolitanism.

Augusto Severo, who was a member of the Brazilian Parliament, was a man of many sides and of brilliant achievements. He was distinguished in Science and renowned as an orator. He was a philanthropist in the widest acceptance of the word, for the passion of his life was to do all in his power to promote the cause of International peace. It was this object which enkindled his enthusiasm for aëronautics, and to progress in that science he looked as the surest means of realising the dream of the idealist. This noble passion no doubt led him to plead with brilliant eloquence the cause of aëronautics in the Brazilian Chamber of Deputies, on June 17th, 1901, when the Chamber was for eight days transformed into a National Aëronautical Congress. It was his convincing eloquence that won for the hero of the Eiffel Tower national recognition, and a vote of 125,000 francs for the experiment of the 13th July, 1901. By this enlightened act Brazil placed herself in the van of progress amongst the nations, and in thus being the first nation boldly to proclaim that aëronautics can no longer be regarded as a mere pastime but as a noble science, destined to enlarge the boundaries of many other sciences and to advance the progress of man, Brazil will have won the reverence and esteem of aëronauts of every nationality for all time. (Applause.)

VOTE OF CONDOLENCE.

The CHAIRMAN: As there is no discussion upon these papers that we have heard read in the absence of our friend Major Roberts (who should have taken the chair this evening, and I am sorry to say is prevented from doing so by illness), I think that this period of the closing meeting of the session of the British Aëronautical Society is a fitting opportunity for making a few remarks upon the lamentable accident to one who had achieved so much towards the solution of the difficult problem

of aërial navigation; and while we welcome amongst us this evening our distinguished visitor the Brazilian Minister, and others who have honoured us with their presence, I am quite sure that we all wish to express our deepest regret at the sad catastrophe which happened to Senhor Severo, and to offer our sincere sympathy to the Brazilian nation in the sad loss of a brilliant politician as well as an intrepid and enterprising aëronaut—a man that the world could ill afford to lose. I will, therefore move a vote of condolence with the Brazilian nation, a nation so illustrious in aëronautical achievements.

Major F. C. Trollope (late Grenadier Guards): Ladies, your Excellency, and Gentlemen,—I am honoured by the wish that has been expressed that I should second this vote of condolence to the Brazilian nation. The Brazilian nation has shown us the way in the aëronautical world by producing such men as Santos Dumont and Augusto Severo. Unfortunately, this deplorable accident has taken place, and has put us back a little; but still, we hope to try again. I beg to second this deep vote of condolence from the whole of the British Aëronautical Society.

Dr. Hugh Robert Mill, LL.D., F.R.G.S. (Secretary Royal Meteorological Society): Mr. Chairman, I am honoured to be asked, as a representative of British Meteorologists, to support this vote of condolence with the Brazilian people. I may, perhaps, be allowed to say one word as to how it is that meteorologists look with such hope and such interest at the advances in the navigation of the air. It has gradually been dawning upon the meteorological world that the great problems which effect the distribution of the weather on the surface of the earth will only find their solution when the movements of the upper air have been fully investigated and understood. Now, we have done for many years past, what has been possible, and done it with difficulty, in the way of starting high level observatories. We have also, following in this case the lead of the United States of America, endeavoured, by the use of kites, to carry our meteorological instruments up to a great height in the free air. And for a very long time back, in fact ever since balloons were first introduced in this country, meteorologists have taken a leading part in the investigations of the higher air. But the great desideratum is to have the means of moving freely up and down and to and fro; to have the means of staying aloft for as great a time as may be required, stationary, or moving as desired in any direction; and it is there that we look to Brazil for great developments in the future. The illustrious Brazilians, whose work in proving practicable—proving, at least, possible—the navigation of the air, have, it seems to me, laid the whole world deeply in debt. And no one—no people—are more ready to appreciate valour and enterprise than we of the United Kingdom. I remember very well how, when Dr. Nansen started forth on an enterprise which, to geographers, appeared quite as dangerous and quite as uncertain as aërial navigation may appear to ordinary engineers, that he resisted all arguments proving the danger of the enterprise. He had convinced himself of the truth of his theory, and he was prepared to risk his life on that fact. And when he returned with a quiet modesty, he simply said that he had proved his theory to be true. Now the line, as Mr. Bruce so very truly said, between success and failure in all new enterprises is a very narrow line indeed. And it is hardly within human control to say on which side of the line any given experiment will terminate. But I think the spirit of the old English poet animates us still when we consider that "He either fears his fate too much or his desert is small, who will not put it to the touch and win or lose it all." And in memory of one who did put it to the touch, and happened to lose it all, I think that we ought to associate ourselves in this vote of condolence with the Brazilian people, that great nation of the South-West upon whose flag there appears the brilliant motto incorporating order with progress. (Applause.)

The Chairman put the vote of condolence to the meeting, and it was carried unanimously.

The Brazilian Minister: It is deeply touching to Brazil, I can assure you, to receive the sympathy from the Aëronautical Society of Great Britain on the fate of our lamented countryman, Senhor Augusto Severo. We live in such a crowded time that one cannot feel to their full extent the shocks that come every day upon us from all parts of the world, as, by their number and their diversity, they almost at once destroy and replace each other. The catastrophe which befell the Brazilian aëronaut was, in that way, overshadowed by another, the much greater one, that made of Saint Pierre, a new Pompeii. But for that rapid succession of discharges from the daily apparatus in constant operation upon our curiosity, our concern, our interests in all things human, the Paris fall would have remained longer present to the

world, as it really grouped some of the characteristics of the tragic side of glory. Senhor Severo, like other Brazilians, had been before carried away by the balloon enthusiasm, but politics made him for a time lose trace of his fixed intent, when the Santos-Dumont tour of the Eiffel Tower came to awake his life's, or his death's, call. It was not jealousy, nor spite; it may have been competition, or emulation, but even that, by pure casualty or coincidence; it was another thing, it was the natural prompting, the inborn inspiration, set in motion by patriotic ambition. He was our second comer, and he thought he would increase, ten times, the natural asset created by Santos Dumont. I regret I am incompetent to deal with any of the scientific or practical merits of his balloon. There is only one point with regard to him upon which I can touch, and that is the noble sacrifice he offered, in his country's name, to the cause of Science. That sacrifice, whether you call it success or failure, we trust, will not remain sterile. Science advances mostly by the faith, the perseverance, the effort, the devotion of the common worker. The achievement, the invention, the stroke of genius or of luck, that form the visible personal contributions, are like everything else, the effect of the pressure from the circumference, the work of the same organic force that, at the proper time, shapes, hardens and ripens the results, like the fruits on the tree. One cannot make too much of imagination, which, alone, no doubt, possesses the creative touch; but one must make still more of the spirit of devotion and sacrifice, whence the kindling spark will ever come of the generosity that links together in the same chain the man who fails and the man who succeeds. The solidarity of success and failure, of finding and searching, of invention and routine, of steering and straying, of victory and disaster, is in the history of Science the necessary qualification of legitimate glory. It would be a sad day for Science when failure of a certain kind was not reckoned as secondary only to success. Ballooning, even now, seems among human achievements the one in which progress depends more on ever successive failures, if heroism and all its moral equipment can ever be called failure. We cannot as yet think of aëronautics as a science that could have been worked out to perfection at the proper time by the simple progress of mechanics, and without one single life being risked. But if such is to be the concept of the future, that would not render the disasters of the pre-scientific times less honourable, and, perhaps, their legend would even grow, once closed the long martyrology of the air. The names written in it for the sake of progress and of Science, as well as of human ambition, like Andrée's or Severo's, will endure for ever. I honour our illustrious countryman's courage, his devotion, his thoroughness of purpose, his loftiness of ambition, his patriotic duel in the heights of the air with Santos Dumont, but above all I honour his fate. Men of that stamp will always be the pride of mankind, if, for nothing else, for their daring and for the kind of game at which they stake their lives. This is a sport of immortality. Last year the aëronauts of England honoured immortal success in Santos Dumont, to-day they honour immortal failure in Severo. It is because they know that, chiefly in their own career, in their deadly flight, failure and success are parts, fragments of each other, successive stages of the same successful evolution. I thank the Aëronautical Society for this demonstration. It is very flattering also, for us, that it met to-night to hear and to applaud a paper on Severo's invention by another Brazilian, Senhor Sampaio, a man of great mechanical and mathematical faculties. I am glad to hear from such authorities as we listened to to-night that the system deserves another test and that it will bear improvement. Senhor Severo's funeral in Rio de Janeiro, you will be gratified to hear, was of unprecedented national magnitude. That means we will remain attached as a nation to the great problem for which he laid down his life. Allow me to pay a finishing tribute of respect to his fate-companion, Monsieur Sachet, for his fearlessness and his disinterestedness, qualities that are inseparable from your noble calling, whatever its rank, but in no one so admirable as in those who have nothing to expect from glory. (Loud applause.)

Balloon Ascents in Thunderstorms,

By The REV. JOHN M. BACON.

Several authentic instances are on record of a balloon either approaching the neighbourhood where a thunderstorm is in progress, or of becoming actually enveloped in an active thunder pack. It is, however, to be regretted that these exceptional experiences have for the most part occurred to voyagers who, not being trained observers, have failed to furnish information of much practical or scientific value. All too obviously, for the most part accounts

have been overdrawn, an error to be extremely regretted both in the commercial as also in the scientific world. It is generally difficult to form a true picture or estimate of the phenomena recorded, and, perhaps, it would not be unjust to urge that all newspaper reports should be strictly estimated at their value as such.

A correspondent in the *English Mechanic* quoting from the *Canadian Weather Guide*, states that the aëronaut, S. A. King, ascended in August weather from Burlington, Iowa, just as a thunderstorm was approaching. When, in the moment of leaving the ground, his balloon was rapidly carried towards the thunderstorm, through which he was borne upwards. But instead of his piercing through the upper limits of the storm "there came down right in front of him, and apparently not more than 50 feet distant, a grand discharge of electricity." Then he felt the car lifted as the balloon was hurled through the cloud, and though it is not quite clear where he was hurled to, it is stated that fresh discharges of electricity kept doing the same thing over again till, finally—the most intelligible part of the narrative—heavy rain carried him down.

Again, the same correspondent, quoting from records, tells of M. le Moste ascending from Dunkirk on June 9, 1883, and being carried into a storm-cloud, where the "beating of the rain, the heavy gusts of wind, and the loud reverberations of the thunder, put the stability of the balloon to a fearful test." Here it would almost seem that the loudness of the thunder was thought to endanger the balloon.

But there follow equally extraordinary statements affecting a French aëronaut of European fame, M. Eugene Godard. Three journalists were his companions in an ascent during which "the balloon was caught in the middle of a thunderstorm, and twice the lightning flashed within a few yards of the terror-stricken crew." Surely it is the journalists here who are responsible for the statement!

Yet another quotation is given, and one which we may regard as of another order. It relates to a public ascent made at Frankfort-on-the-Maine by Green, junior, on August 22, 1847. The hour of departure was 5 p.m., and it appears that Green was determined to keep faith with the public, notwithstanding the fact that a thunderstorm was blowing up with a hurricane of wind from the south-west. When at about 4,500 feet elevation and level with the storm-cloud, the rain was descending like a waterfall. Each discharge of lightning caused a vibratory motion in the balloon. In this instance the aëronaut succeeded in ascending above the storm, when a fine breeze from the north-west carried him clear of the disturbance.

It will be interesting to take the above narration in connection with a report on thunderstorms due to two eminent amateur astronomers, Prebendary Webb and Rev. T. E. Espin—the result of many years' research. According to these observers, when the thunderstorm is coming on the wind is usually blowing N.E., "or against the direction that the storm is coming from." Thunderstorms "come almost invariably from the south-west, and as soon as the storm has passed the wind will blow after it."

But quite as valuable a record is afforded by Charles Green, senior, in an ascent from Newbury in 1827. Green, describing the occasion himself, relates that the morning was very squally, and that the balloon could scarcely be kept down even with the strength of a hundred men. The force of the wind never abated, and when, at 6 p.m., the balloon was released, "it bounded off with great velocity in a S.E. direction, and in a very short space of time was riding the gale at a height of two miles. At this altitude we perceived two immense bodies of cloud operated on by contrary currents of air, until at length they became united, and at that moment my ears were assailed by the most awful and long-continued peal of thunder I ever heard. These clouds were a full mile beneath us, but perceiving other strata floating at the same elevation in which we were sailing, which, from their appearance I judged to be highly charged with electricity, I considered it prudent to discharge twenty pounds of ballast, and we rose half a mile above our former elevation, where I considered we were perfectly safe and beyond their influence. I observed, amongst other phenomena, that at every discharge of thunder all the detached pillars of cloud within the distance of a mile round became attracted and appeared to concentrate their force towards the first body of cloud alluded to, leaving the atmosphere clear and calm beneath and around us."

Charles Green's American contemporary, John Wise, describes a similar appearance of the storm-cloud as viewed from above. He compares it to a violent ebullition which soon developed itself into uprising cloud columns discharging flashes.

Very similar, again, is a description of Captains Peytier and Hossard in 1825; who, from the Peak D'Anie, in the Pyrennees, made

several observations of thunderstorms when these were in progress below, so that the upper surfaces were well seen. These surfaces were always noticed to be broken into ridges and protuberances, rising to great heights, like Alpine peaks.

But no more instructive instance of a thunderstorm observed from above is to be found than that reported last year in the Journal of our Society. I refer to the occasion when three lieutenants of the Prussian Balloon Corps made an ascent from Berlin on June 5, 1900. In this case the balloon was moving from the south-west at a height of 2,300 feet, when it became enveloped in a thunder-cloud. Sharp crackling sounds, as also loud hissings, were heard, accompanied by sparks, one of which was estimated as twenty-seven inches long.

Commenting on this storm, Dr. R. H. Scott points out that, though the thunderstorm at the time passed over Westphalia to the westward and over Pomerania to the eastward, yet no storm was experienced at Berlin underneath. And his explanation is that over the Valley of the Spree, the water being cooler than the air, there was a descending current of air which counteracted the normal ascending current of the squall, the consequence being that the thunderstorm was kept up and so jumped over the river. Dr. Scott adds, "the barometer at Berlin at the time showed the ordinary little jumps characteristic of the passage of thunderstorms, but no thunder or lightning was noticed in the city."

The following is an occasion when, during a balloon voyage from Newbury, I was unexpectedly enveloped in a severe thunderstorm, and remained for some time a close observer of the phenomenon. The date was July 27, 1900, a day which, opening with fair promise, became characterised shortly after noon by a succession of heavy electric storms, increasing in intensity and duration as the day wore on. Wind vanes remained pointing eastward, while cloud, at the height of some 2,000 feet, sailed away from the west. At less than this height, however, pilot balloons which started towards the west became headed back. The ascent was made at 5.15 p.m., at which time the clouds had all dispersed and the wind had lulled. Our course, which at first lay to the north and the north-west, turned nearly due west, and followed pretty closely the windings of the Kennet Valley.

It was about twenty minutes after the start that the air below us, and yet more ahead of us, began rapidly growing murky, while our rate of progress became greatly accelerated. At this period no well-defined clouds were noticeable, our environment being veiled by the curtain of grey haze around; but from the starting ground at Newbury a vast thunder-pack was seen to be already upon us. Then the storm broke with a blinding sheet of hail, and a downrush of piercingly-cold air, the prelude to a terrific display of lightning, which flashed with great frequency and on all sides of us. Observers below informed us that we appeared to be embosomed in the heart of the storm, which completely enveloped us.

To ourselves, though the view overhead was hidden by the vast bulk of the balloon, it was evident that the flashes emanated from a region somewhat above our own level. Thus, to the eye, the manifestations of the lightning partook of the usual appearance, namely forked streaks of flame; but so bewilderingly brief and brilliant that the mind could scarcely determine whence they came or where they vanished. The thunder was no less remarkable, being short, with little rolling. It was clear that existing conditions stifled to us the usual reverberation; and this fact was confirmed by an experiment. Just as the storm was gathering I had fired a gun-cotton fog-signal below the car, and had remarked how the long-rolling echoes, always evoked, had been almost entirely quenched. Doubtless, then, the air was in extreme turmoil, either the cause or consequence of the electrical disturbance then being manifested. Broadly, the atmospheric conditions at this moment were a lower warm and now fast current still setting westward, an upper current bearing the storm-cloud diametrically opposed to the former, and, again, a swift, overmastering down-draught of ice-cold air, sweeping down the hail and carrying us towards earth.

A question arises here of much interest to aëronauts. Is a balloon entrapped in a thunderstorm in special danger of being struck by lightning? My own belief is that if it is being held captive by a steel cable the danger is extreme; and we heard of a fatal accident not long since to soldiers in charge of a military balloon kept flying while thunder was round. On the other hand, I do not fancy that special danger from lightning attends a free balloon if only from the fact that I know of no record of disaster, though balloons must have constantly ascended in thundery weather.

A feather or other floating body in the neighbourhood of an electrical machine in action is surely repelled rather than attracted. There is, however, of course, always the

possibility of a floating balloon being in a line of low resistance in which a discharge is preparing, in which case it would surely encounter such discharge.

After the reading of this paper, Mr. Bacon exhibited several lantern slides illustrative of his remarks, including a very fine series of photographs of lightning flashes.

Note on a Performance of the "Bristol" War Balloon during the South African Campaign.

BY CAPTAIN H. B. JONES, R.A.

[This communication formed part of a letter from Captain Jones, received from Machadodorp, Transvaal, by the Honorary Secretary.] It was read in the absence of Captain Jones by the Honorary Secretary.

"The 'Bristol' War Balloon, 11,500 cubic feet capacity, was first filled on March 6, 1900, the gas being transferred from 'Duchess of Connaught' leaking badly from bullet-holes received at Paardeberg. The balloon was up throughout the fight at Poplar Grove, and was emptied on March 9 without any repair in shops at the base; it remained on the section waggon until filled at Vet River (advance from Bloemfontein) on May 6. It was used at the engagements at Vet River and Land River, and arrived at Kroonstad on May 12. The balloon was kept in a sheltered place near the river till we marched again, on May 22, and was not emptied till after we had crossed into the Transvaal at Vereeniging on May 27. To keep a balloon going for 13 days at one station is a good test, but in our case the 'Bristol' was filled for 22 days, and did a march of 165 miles with the division.* It is unnecessary to say that this could not have been done with even a perfect balloon unless the weather had been good and the men of the section highly trained; it speaks wonderfully well for the fabric. The leakage was practically nil, but we occasionally had to run in some gas in the early morning to prevent the risk of towing a *ballon flasque* against the breeze which always came up with the sun, and later in the day we had to allow the expansion to run out. We had a very hard day the day before we crossed the Vaal, and I was inclined to empty the balloon, but the whole section were keen to get the 'Bristol' into Transvaal territory, and we did so. Our transport was oxen, slow but sure. We generally got into camp after dark, and yet the men, tired with a long march, were always keen on doing everything they could to safeguard the balloon from the dangerous morning draught which caught her when she was slack and flapping."

* It was at Fourteen Streams that a balloon worked continuously with one inflation during the late war.—ED.

Note on The Cycala Flying Machine.

BY DR. CHARLES ZIMMERMAN.

The ideal Flying Machine is the product of Nature, *i.e.*, the soaring-bird type. We have been endeavouring to construct a duplicate for nearly twenty years. We do not expect to realize our ideal, but we can approximate it and come nearer to it than if we had never tried. In our search for the secret of man-flight, at least half a dozen full-sized man-carrying machines have been built and experimented with, besides numerous models, each a different design, and like all other machines designed to navigate the air by other students and workers, failed to do more than get broken and smashed in pieces long before the testing was half completed. Enough, however, was gleaned to demonstrate that we were on the right track, and a little nearer the long sought-for goal. Still, we had not, as yet, discovered the key to the hidden truth, and it was necessary to do the same thing over again, making changes here and there, adding new improvements, until, at present, there is great encouragement to continue in the line of thought and experiment chosen, as it promises finally to produce what we are all looking for, and that, very soon.

The machine, "Cycala," now building, is about (35 ft.) thirty-five feet across tips of wings. The latter I propose to vibrate vertically, to get forward motion on the ground as well as in the air. I constructed a model of the same design as my machine. It was about eight feet across wing tips; during the past winter it was submitted to many trials, with the result that ultimate success is promised with a larger machine.

In all my trials with different models, I have concluded that it is a matter of getting the first start on the ground. The machine must lift itself from level ground; in order to do this, there must be primarily traction or propulsion *on the air*; the rest is, we surmise, comparatively easy. This, of course, presupposes that equilibrium and alighting or stopping are worked out. A bird jumps up and simultaneously flaps its wings at starting, and *begins to fly* when its forward speed is only a couple of miles an hour. Now, why should not a properly-constructed flying-

machine, adapted to the strength of a man, do the same?

A motor can be applied when needed, in which case two or three pounds in weight can be carried to every one square foot of sustaining surface, and by vibrating the whole supporting surface, less forward speed will be required to elevate, and more weight to a square foot can be carried. As to the how and why of all this, I propose to inform the members of this Society, after the necessary trials have been made, as there are several ways of applying power, and it is more than probable that alterations will have to be made. I can, however, assure any who may be interested that I have a mode of vibrating my thirty-five-foot machine, and herein probably lies the secret. If we can readily and easily vibrate the wings sufficient propulsion will be developed to produce flight, but I beg time until it is tested. If it goes, the problem of a one-man machine is solved; but if it shows a predilection for sticking to the ground as have all its predecessors, I shall try again.

The CHAIRMAN: Ladies and Gentlemen,—I think a great deal might be said upon these interesting papers that we have heard this evening; but I think I shall be best studying your comfort if I make no comment upon them beyond thanking those gentlemen who have contributed the papers, and our Honorary Secretary for so ably reading no less than four of them. With these few words I beg to conclude the meeting. There is a machine, I am told, on exhibition here to-night showing new steering apparatus for balloons by Mr. Harris. He will be pleased to explain it to anyone interested.

The meeting concluded with a vote of thanks to the Chairman.

THE PRESIDENT OF THE AËRONAUTICAL SOCIETY OF GREAT BRITAIN.

As will be seen in another part of this journal, the members of the Aëronautical Society will shortly have the long-awaited opportunity of welcoming their President. Readers of this journal have already been reminded of the long service of the President in the South African war with the Scots Guards, a service extending throughout the whole of the campaign. A daily contemporary has reminded the public that this period of active service is the longest the Guards have yet known, and that forgetfulness through lapse of time should not be allowed to be the cause of a welcome home that is not commensurate with the warmth of the farewell bestowed on regiment after regiment, when, on the way to South Africa, they marched out of barracks on the cold foggy morning in October, 1899.

But it is not necessary to give any such reminder to the members of a scientific society, for the students of science are daily trained to bind together in their minds the past and the present; and with the welcome which will be awarded Major Baden-Powell, when he first

MAJOR B. BADEN-POWELL,
President of the Aëronautical Society of Great Britain.

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takes the Presidential chair and addresses the Society on the progress that has been made in aëronautics since he left our midst to face the dangers of the battle-field, will be linked the vivid and grateful memory of the days during which he acted as Hon. Secretary to the Society. It is well known to our members that when Major Baden-Powell took up the Secretaryship of the Society on the death of the late Mr. Frederick Brearey, the Society, though not dead, was in a state of low vitality. But a few months of his energy aroused it into vigour. At the time he became the Honorary Secretary aëronautics was at low ebb throughout the world. Now, in every country, there are signs of daily progress. How much of the renaissance is due to those vigorous articles in the *Aëronautical Journal* from the pen of its

founder demanding the attention of the world for the science of the air?

It is hardly necessary to remind the members of the Society of the long connection of the President with aëronautical matters, but this journal now finds its way beyond the members of the Society to distant lands. Therefore, a few facts concerning our President's aëronautical career may be of interest.

It was in 1881 that Major Baden-Powell made his first balloon ascent in company with Mr. W. Powell, M.P., and Mr. Wright, the aëronaut. A little later in that year he ascended with Colonel Brine, R.E., and Mr. Simmons. In 1882 he joined the Scots Guards. In March, 1883, he made captive balloon ascents at the Brighton Volunteer review, and in the same year delivered a lecture on military ballooning before the members of the Royal United Service Institution. At this time he was much engaged in experimenting with model aëroplanes and aërial screw-propellers. In 1884, he bought the balloon Eclipse, and made several ascents in it at Aldershot. During 1884, Major Baden-Powell was in Egypt with the Camel Corps. In 1887 he began his experiments with kites. During 1888-91 he was absent on staff in Australia. In the autumn of 1892 he began those systematic experiments with kites, which were continued up to 1897. In the spring of 1894 he constructed the huge kite, 36 feet high, and made many trials with it at Pirbright. On June 27 in that year he first lifted a man from the ground by its means. In the autumn of the same year he went through a course of military ballooning at Aldershot. In September, 1895, he was able to lift a man one hundred feet by means of his kites, and gave a demonstration of the man-lifting power of his kites before the meeting of the British Association at Ipswich. At the present time, when the kite is rapidly coming into favour with meteorologists as one of the surest means of obtaining reliable scientific records of the atmosphere, the pioneers of the kite movement, who were Mr. Douglas Archibald and the President of our Society, should be remembered. In 1896, Major Baden-Powell became the Honorary Secretary of the Aëronautical Society, and in the next year published the first number of the quarterly illustrated *Aëronautical Journal*. His zealous work in the cause of aëronautics, as Honorary Secretary of the Society and editor of its journal, was maintained until the outbreak of the Boer war, in 1899, interrupted his peaceful aeronautical labours. But during the war in South Africa, he had opportunities of testing the value of his portable kites for wireless telegraphy, work that has already been the subject of comment in this journal. Amongst Major Baden-Powell's writings are, "The action of a bird's wing" (Chicago Conference on Aërial Navigation, 1893); "Ballooning as a Sport," Blackwood's Magazine (1895); "Man-lifting Kites," National Review (1896); "The Conquest of the Air," United Service Magazine (1897).

In March, 1898, Major Baden-Powell read an exhaustive paper before the members of the Society of Arts on "Kites in theory and practice," for which he obtained the Society's silver medal.

The Balloon Centenary at Bath.

Owing to the enterprise and hospitality of Mr. Patrick Alexander, the Secretary for Great Britain of the International Aëronautical Commission, on Tuesday, September 8, the centenary of the first balloon ascent made in Bath by Garnerin in 1802, was celebrated in Sydney Gardens, Bath, by a balloon ascent at the very hour (6.10 p.m.) on which Garnerin ascended a hundred years ago.

There was a truly representative gathering present to witness the ascent, including Major Baden-Powell, the President of the Aëronautical Society of Great Britain, Major F. C. Trollope, Vice-President of the International Aëronautical Commission, Mr. Eric Stuart Bruce, the Honorary Secretary of the Aëronautical Society of Great Britain, the Hon. C. S. Rolls, a promoter of the Aëro-Club, Dr. Barton, Messrs. Young, Groombridge and Cody, and others.

At 4.20 the proceedings opened by the dispatch of a small sounding balloon duly equipped with self-recording instruments, and at five o'clock a pilot balloon was released to test the strength and direction of the wind. At 6.10 the Alexander balloon, of 35,000 cubic feet of gas, with Messrs. Gaudron and Poole in the car made what has been described as a "majestic" ascent in the still atmosphere which favoured the occasion, clearing the large tree which occupied a rather menacing position, and taking a westerly direction.

In the evening Mr. Patrick Alexander sumptuously entertained the assembled guests at dinner. The room in which the pleasant gathering was held bore tasteful emblems of the occasion. A beautifully-made model of a

balloon with car complete floated in the centre of the room, while even the cakes of the dessert were in the shape of tiny balloons; the same emblem of the occasion was engraved upon the menus before the guests. During the dinner came the welcome news of the descent of the Alexander balloon at Chew Magna, and a telegram with information of the finding of the sounding balloon and its instruments. Not very long afterwards Mr. Gaudron entered the dining-room, having returned from the aërial trip in time to partake of some of the festivities.

But the pleasant proceedings did not terminate with the day of the balloon centenary celebration. They were most agreeably prolonged into the next. On Wednesday morning the party drove out to Mr. Alexander's experimental works at Batheaston, to enjoy a programme of aëronautical demonstration. Great interest was afforded in viewing Mr. Alexander's varied collection of aëronautical apparatus, but the *pièce de résistance* was the flight of Mr. Cody's kite. The easterly wind blowing was favourable for this demonstration, and the large kite of some 20 feet in length ascended steadily into the air, a mile of wire being let out. When up, it remained almost motionless. Small kites were sent up along the wire to the larger kite. One of these carried a charge of gun-cotton, which duly exploded at a height. After the flight of Mr. Cody's kite the party again partook of Mr. Alexander's hospitality at lunch. Afterwards another sounding balloon was despatched. It was late in the afternoon before the guests dispersed, more than ever convinced of the fascinations of the science to which they have become devotees.

The St. Louis Airship Competition.

The Louisiana Purchase Exposition has appropriated the sum of Two Hundred Thousand Dollars for an Aëronautical Competition and Exhibition. Of this the sum of ONE HUNDRED THOUSAND DOLLARS is offered as a grand prize, to be competed for and awarded under the rules and conditions hereinafter prescribed. Fifty Thousand Dollars has been appropriated for minor and subsidiary prizes for competition between airships, balloons, airship motors, kites, etc. The remaining Fifty Thousand Dollars is reserved for the expenses incident to the competition.

Rules and Regulations

GOVERNING COMPETITION FOR THE GRAND PRIZE OF $100,000.

(*a*) The Competition is open to all, without limitation as to the power used or the mechanical principles involved.

(*b*) No applicant shall be admitted to the Competition who does not present satisfactory evidence of having at some time made a flight over at least a mile course and return, with a machine similar in principle to that which he proposes to use in the Competition. The submission of this evidence may be delayed to within ten days of the first competitive trial if reasonable cause for such delay seems to exist. The Aëronautical Jury may rule out, after due investigation, any machine deemed too hazardous to life.

(*c*) All preliminary entries shall be considered as confidential.

(*d*) No vehicle shall be admitted to the contest which requires any permanent and visible connection with the earth or which is not absolutely free in its flight after the start has been made.

(*e*) As an evidence of good faith, an entrance fee of Two Hundred and Fifty Dollars ($250.00) will be required, which will be refunded when the exhibitor occupies the space assigned him with an apparatus conforming to the rules.

(*f*) Each vehicle shall carry at least one person in its flight.

II.

GRAND AND MINOR PRIZES.

(*a*) The competitor making the best average speed in strict accordance with these rules and regulations, provided that he has made the entire course three times at an average speed of not less than twenty miles an hour at each time, shall be awarded the grand prize of One Hundred Thousand Dollars, together with a suitable diploma, medal or certificate.

(*b*) There will be four minor prizes, consisting as follows: First prize, $3,500; second prize, $3,000; third prize, $2,000; fourth prize, $1,500. These shall be awarded in order of speed to the four competitors coming nearest to the record of the winner of the grand prize; provided that each of them shall, at least, have made the full course three times, and each time at an average speed of at least ten miles an hour. Each winner of one of these prizes shall receive a suitable diploma, medal or certificate recording his achievement

III.

THE COURSE.

(*a*) The prescribed course will begin and end in the athletic amphitheatre adjoining the aëronautic stabling ground in the Exposition enclosure. If for any reason this appears to be impracticable the Aëronautical Jury may permit the start and finish to be from other parts of the aëronautic enclosure.

(*b*) The course will be shaped like the letter L—one leg being the shorter and in full view from all parts of the Exposition grounds. It will be marked by three captive balloons (at points marked A-1, A-2 and A-3 in diagram herewith). The starting point will be the angle B. The aëronaut shall have his choice of the direction in which to start, but he shall turn round the captive balloons A-2 and A-3 in opposite directions; *i.e.*, one to the right and the other to the left.

(*c*) The length of the entire course will not be less than ten miles (16 kilometers) nor more than fifteen miles (24 kilometers). reckoned in an air-line from centre to centre of the captive balloons, the exact length and direction being determined and accurately measured by the International Jury having charge of the contests.

IV.

AWARD DETERMINED BY SPEED.

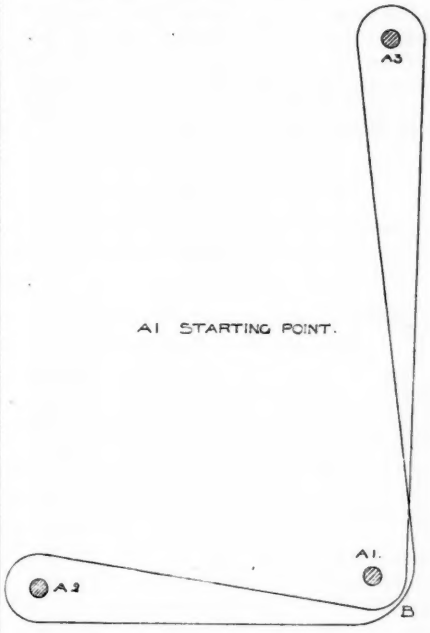
(*a*) The grand prize shall be awarded to the competitor whose average speed during his three fastest trips around the course shall be the greatest, according to the rules and regulations.

(*b*) Every competitor will have the privilege, at any trial, of passing over the course, without stopping, as many times as he desires in a continuous flight, and in such case his time as recorded by the judges shall be the average time in which he covers the full course, but this shall count as but one trip.

(*c*) Every competitor may make as many trials as he chooses, within the hereinafter prescribed dates. No trial will be considered by the judges in which he does not go around the prescribed course once, and the navigator must make, during the period allotted for the contests, at least three complete trips around the course. The average time made on each of his three best trips must be at the rate of at least twenty miles an hour, including the time consumed in the starting and landing, reckoned from the time the vehicle parts free of the ground or starting stage, until his car again touches the earth within a radius of fifty yards from the starting point without serious injury to either man or apparatus.

(*d*) Each contestant's official time shall be the average of the records of his three best trips.

(*e*) The average speed of the machine shall be computed for the actual air-line distance over the ground, making no allowance for the wind or for deviations from straight lines to or from the captive balloons.



PLAN OF COURSE FOR COMPETITION FOR GRAND PRIZE OF $100,000.

V.

TIME OF COMPETITIVE TRIALS.

(*a*) The competitive flights must take place between the first day of June and the thirtieth day of September, 1904, inclusive. The specific weeks for the trials will be determined by the International Jury and announced in advance. Each competitor must make at least one trial within each of said weeks, but he may choose his own day or days, which must be days on which the Exposition gates are open to the public, and such choice must be announced to the judges before midnight of the day previous so that announcements may be published in the morning papers.

(*b*) The start must be made between ten o'clock a.m. and sunset.

(*c*) If, on September 30th, it shall appear that two or more competitors have made equal records, the jury shall prescribe a further trial or trials, under the same rules and regulations as have governed the preceding contests.

(*d*) The successful competitor must give three exhibition flights after September 30th, but the award shall be in no way affected by the success or failure of such exhibition. In order, however, to insure such exhibition taking place the Exposition Company may withhold thirty per cent. of the total grand prize and pay one-third of the amount thus withheld to the successful competitor after each of said three exhibitions.

Rules and Regulations

GOVERNING OTHER AERIAL CONTESTS BY AIRSHIPS, BALLOONS, ETC.

I.

AIRSHIPS NOT CARRYING OPERATOR AND GLIDING MACHINES.

(*a*) A prize of Twenty-five Hundred Dollars ($2,500.00) is offered for the flying machine, not carrying an operator, making a straight-away run of one mile and return to approximately the starting point, in the shortest time of actual flight. In addition to the weight of the complete machine, with all its appurtenances and fuel, it must carry a load of ten pounds. The details of the time of this contest will be determined by the International Jury. The judges will establish two parallel base lines, one-fourth of a mile long and at least one mile apart. These lines will be laid out on the day of the trial and with reference to the prevailing wind, if any. The machine will be started from the centre of the leeward base line and at right angles to it, and shall proceed against the wind. It shall cross the other base line before landing, and may then be caught and started back from the centre of the windward base line, proceeding down the wind and crossing the leeward base line, practically as indicated by the diagram herewith. The judges may in their opinion order that the competition for this prize shall be made in a calm.

(*b*) A prize of Two Thousand Dollars ($2,000.00) is offered for the gliding machine, mounted by an operator, which shall advance in a calm or against the wind at a vertical angle most acute with the horizon. It shall make at least twenty glides of not less than four hundred feet each. A prize of One Thousand Dollars ($1,000.00) is offered for the gliding machine, mounted by an operator, exhibiting the best automatic stability in the wind during at least forty glides not less than four hundred feet each, under rules to be prescribed by the judges. Each competitor may provide special appurtenances for starting and landing, at his own expense.

II.

MOTORS FOR AIRSHIPS OR DIRIGIBLE BALLOONS.

A first prize of Twenty-five Hundred Dollars ($2,500.00) and a second prize of One Thousand Dollars ($1,000.00) are offered for the airship motors other than the exact machine winning the grand prize, having the least weight and greatest efficiency in proportion to their power. There are no limitations as to the kind of type, but the motor must have a minimum capacity of one-brake horse-power and shall not exceed a maximum of 100-brake horse-power. The weight of the motor is to include all appurtenances (tanks, water, etc.) and fuel, or its equivalent, for a run of one hour. It must be so constructed that it can be attached to an apparatus for making a brake test. The first test will cover one hour's run to determine power, and the second test a continuous run of ten hours for ascertaining the reliability and durability of the apparatus.

III.

One prize of Three Thousand Dollars ($3,000.00) for a successful attempt to drive an airship motor by energy transmitted through space, either in the form of electric radiation or in some other form of electrical energy, to an actual amount of one-tenth of a horse-power at the point of reception and at a distance of at least one thousand feet. The test must be made on the Exposition grounds by experts satisfactory to the jury.

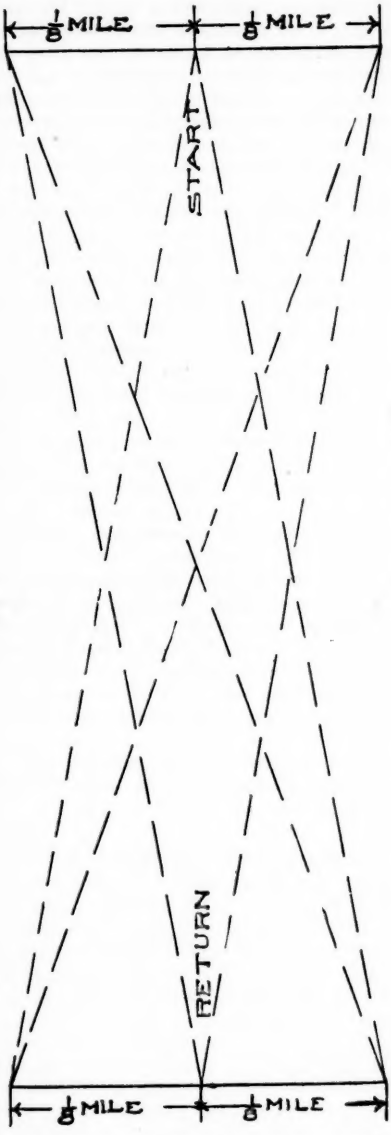
IV.

BALLOON AND AIRSHIP CONTESTS.

Four prizes of Five Thousand Dollars ($5,000.00) each, are offered to the aëronauts who win in the following contests—each being the first and only prize in its class. These contests will be open to balloon and airships or aëronautical vehicles of any type, carrying at least one person.

(*a*) For the greatest altitude attained, starting from the Exposition grounds.

(*b*) For the longest time in the air, starting from the Exposition grounds.



PLAN OF COURSE FOR FLYING MACHINE NOT CARRYING OPERATOR.

(*c*) For landing nearest to the Washington Monument in the City of Washington, D. C., the start being made from the Exposition grounds, in St. Louis.

(*d*) For the longest distance travelled in one flight in any direction, starting from the Exposition grounds.

(*e*) Time—These four contests will take place on four different dates, to be announced by the jury at least six days before the dates, on which every contestant must start.

(*f*) In the race to Washington, D. C., each contestant may make as many subsequent trials as he may choose prior to the first day of November, 1904, at which time the prizes shall be awarded.

(*g*) Entry Fee—An entry fee of Two Hundred and Fifty Dollars ($250.00) will be required in each of these four contests, the fee to be returned after the competitor takes possession of his space and is ready for the competition.

VI.

GENERAL REGULATIONS APPLYING TO ALL AËRONAUTIC CONTESTS.

(*a*) The conduct of the contests will be in the hands of an International Jury, to be hereafter constituted, but will be subject to these rules and regulations:

(*b*) No hot-air balloons will be permitted.

(*c*) The Exposition Company will provide suitable enclosure for the aëronautic grounds, and defray all necessary operating expenses connected therewith, but each competitor must provide any special structure or apparatus required by his exhibit, at his own expense.

(*d*) The Exposition will provide at cost price all gas and fuel that may be required by the competitors at the expense of the competitors, and no competitor will be allowed to provide his own fuel or manufacture his own gas.

(*e*) In case of unfavourable weather conditions on the dates set the judges may postpone the contests or order them to be repeated.

Obituary.

SIR FREDERICK ABEL, BART.

Though the late Sir Frederick Abel was a specialist and had the reputation of being the greatest living authority on explosives, he showed throughout his life that it is possible to be a specialist and yet extend sympathy to most varied departments of science. The loss of Sir Frederick Abel will be most keenly felt by

the scientific world generally, and more especially by those numerous scientific institutions to which he devoted himself with heart and soul.

Not only was Sir Frederick Abel a member of the Royal Society, but he was the recipient of a gold medal in 1887 from that illustrious body. For nearly half a century he had been actively connected with the Society of Arts. In 1868 he was elected on the Council; and as time went on, served as Vice-President and Chairman. In 1891 he was the recipient of the Albert Medal. In 1886 he was appointed organising Secretary of the Imperial Institute, though, subsequently, he gave up the remuneration of that office and became Honorary Secretary and Director.

But it is his connection with aërial matters that demands notice in this journal. It was the developments of electric balloon signalling that specially attracted the acute perceptions of Sir Frederick Abel. He at once realised that signalling at an altitude by making military signalling independent of the configuration of the country, gave it a new and important character. Almost immediately after Mr. Eric Stuart Bruce gave his first demonstration of his electrical signalling balloon at the Albert Palace in 1885, Sir Frederick Abel, being on the Government Committee which attended to these matters, urged that the invention should have the immediate attention of the Government, and obtained a Government grant for the inventor to carry on experiments for the War Office; experiments which resulted in orders from the British Government, an example quickly followed by several other Powers.

In his Presidential address before the British Association, he spoke of the flashing of incandescent electric lamps in mid-air from the ground as one of the triumphs of electricity. It was Sir Frederick Abel, too, who, on the occasion of the opening of the Yachting Exhibition at the Imperial Institute, personally conducted the King, then Prince of Wales, to the gallery, in which demonstrations were being given of the value of the signalling balloon in naval operations. Through his enterprise, too, was delivered the lecture at the Imperial Institute in 1897 on the adaptation of electric balloon signalling to Arctic exploration.

Side by side, with his scientific abilities, Sir Frederick Abel displayed sterling qualities. He acknowledged merit for merit's sake when he saw it, nor did he hesitate to speak of others the kind word where it could avail.

NOTES.

Professor Langley's New Experiments.—All interested in the progress of aërial navigation by bodies heavier than air will be glad to hear that Professor Langley is conducting experiments for the American Government. He is not prepared yet to make results of his experiments public; but during an interview with the Honorary Secretary of the Aëronautical Society of Great Britain last month in London, he said that he considered we are within measurable distance of a great advance in aërial navigation, and that in two years' time we might expect to witness important results. The Professor expressed his keen interest in the projected experiment of Dr. Barton, in which the latter intends to combine aëroplane and balloon. Though Professor Langley has hitherto himself been the Apostle of the body heavier than air, he considers that those inventors who employ the balloon in a subsidiary sense—as a lifebuoy, with the intention of reducing by degrees the balloon portion of the apparatus till only a body heavier than air remains, have reason on their side. He expressed his admiration for M. Santos Dumont, whom he described as a man of great ability. Speaking of the late M. Severo's death, incidentally, he remarked that though the navigable balloon had not been in his line of thought, he saw no reason against the view expressed by the author of one of the papers at the last meeting of the Aëronautical Society of Great Britain, that possibly the safest place for the motors in a navigable balloon might be the interior of the gaseous envelope.

The Journey of the Mellin Airship Across the Metropolis.—In the last number of this journal there appeared a description of the Mellin airship, which accomplished a journey from the Crystal Palace to Harrow on September 19. The journey reflects great credit on Mr. Stanley Spencer, who has redeemed Great Britain from the reproach that no one in this country had made a journey in a navigable balloon. It has now been claimed that Great Britain now holds the record in airship achievements, the aëronaut having estimated that taking into account his numerous evolutions he traversed 30 miles in his airship. But this opinion opens a controversy. In 1885 from Meudon took place the first return journey by Captains Krebs and Renard in their electrically-propelled balloon. They may claim

that a return journey to the place where the balloon started is a greater feat than a journey across a capital when it is not absolutely clear how much the aërial currents encountered aided or hindered the course. M. Santos Dumont, too, will, perhaps, claim that he still holds the palm, as he made a journey up to time under stated conditions. But to the scientific mind the real test of progress is the wind force overcome. The virtue of a navigable balloon is shown, not when it drifts with the wind, but when it is set in the teeth of the aërial current. Mr. Spencer certainly showed that his balloon could be steered, for he made evolutions around a church spire and so forth, which set the matter beyond doubt. But he cannot be said to hold the record of progress until it is known whether the wind forces he combated in making these evolutions were in excess of those overcome by previous experimenters. This is not likely, from the anticyclonic condition on the day on which the experiments were made, and prudently awaited for months by Mr. Stanley Spencer. It does not appear that any steps were taken to secure scientific measurement of the atmospherical conditions. The absence of these tests on such occasions is to be regretted, as the experimenter loses the advantage of figures which, alone, can give him his exact position in the history of progress. Some very excellent photographs of London and the neighbourhood were taken by Mr. Spencer from the airship. Four of these appear in the "Illustrated London News" for September 27.

The Navigable Balloon Scheme of M. Torres.—In August last a note appeared in "Nature" on the project of M. Torres for making a navigable balloon with an interior keel. The object is similar to that which inspired the late M. Severo, viz., to bring all the forces acting on the balloon into the same horizontal line. M. Torres proposes to make a balloon with several compartments, containing a central beam suspended in its interior and forming with its attachment a rigid internal keel. The propeller is to be attached to the end of this beam-end. The car is to be very small and close up to the balloon. We must, however, agree with "Nature" that with such a terrible example in our recent memory as the fate of M. Severo, the proximity of car and its motors to the balloon raises misgivings, if petroleum is to be the source of power.

The Investigation of the Upper Atmosphere by Means of Kites.—The Committee on "the investigation of the upper atmosphere by means of kites," made a report on their useful work at the meeting of the British Association at Belfast. It has been decided to make the kite observations either in thinly-inhabited parts of the country or over the sea, so as to reduce the risk of any accident to a minimum. Since nothing was known of the vertical temperature gradient over the great oceans, and this knowledge was of supreme importance for theoretical meteorology, it has been decided to work on the west coast, since the prevailing westerly winds make observations in such a locality equivalent to those taken over the sea. It was thought desirable to take some observations at the same height as Ben Nevis, somewhere on the coast in the neighbourhood of Ben Nevis, so that light might be thrown on the question as to how far the temperatures taken on a mountain summit differed from the temperature of the free air in the surrounding districts at the same level. It was decided to fix the apparatus at Crinan, about 30 miles south of Oban. The kites employed differed in form from those employed at the Blue Hill Observatory, in the United States. The highest record of height for the kites had been 11,450 feet, when 21,000 feet of wire was employed. The temperature gradient observed on that occasion was approximately two and a half degrees (Fahr.) for every thousand feet of ascent. The experiments are to be conducted for another year, during which it is hoped that flights may be arranged so as to obtain exact information regarding the distribution of temperature and humidity in specific conditions of weather; thus the physical processes taking place in the upper air corresponding to weather changes noted at the surface could be examined. We may add the hope that such valuable experiments with kites may not only be carried on for one more year, but every year.

The Recent Balloon Voyage of Comte Henri de la Vaux.—The second attempt of Comte Henri de la Vaux to cross the Mediterranean in his balloon has ended like the first, without the accomplishment of the object. On September 21, Comte Henry de la Vaux, accompanied by M. Castillon de Saint Victor, M. Laignier, and M. Hervé, started from the Aërodrome, at Palavas les Flots, near Montpellier, in the balloon "Méditerranée II." The balloon was provisioned for several days and was escorted by the torpedo destroyer "Epée, being attached to the deviator, which

kept it at a uniform height of 100 feet above the water. At 10 o'clock on the morning of September 22, the balloon was sighted by the captain of an Italian vessel, twenty-five miles south-east of Palavas. Eventually a contrary wind caused the attempt to be abandoned, and the descent was made at Marseillan, between Atte and Agde.

REVIEWS.

Aërial Navigation.

By FREDERICK WALKER, E.E., LONDON, CROSBY, LOCKWOOD AND SON.

A new book on aërial navigation has been made by Mr. Frederick Walker, C.E. It contains a large fund of information respecting the designs and devices of comparatively unknown inventors of aërostats, airships, and flying machines; and though it is "a practical handbook," it is not made clear to the reader which of the many contrivances mentioned have proved of practical value to the science of aëronautics, and which have never got beyond the Patent Office. To the practical student, therefore, the book must be obscure. Even when the case of a machine that has been tried is mentioned the reader is left in absolute doubt as to the result. In chapter VIII., in speaking of Partridge's airship, the author says, "it made several *successful* flights." Considering the *successful* flights of airships have been few, how useful it would have been to the student to know in what lay Partridge's "success."

One fact we may say with certainty about Mr. Walker's book is that the author has not been careful to secure accuracy. The very first page opened by the reviewer contains the following surprising statement. Speaking of modern airships on page 133, Mr. Walker says, "Dr. Barton, in the United States, has just built an airship, the trial of which has not yet been reported!" Now, Dr. Barton is an Englishman, who frequently takes the chair at the meetings of the Institute of which Mr. Walker is an associate member. He is not building an airship in the United States, nor has he yet built one at all, beyond preliminary models. He is, however, soon going to commence to build an airship in this country at the request of the British War Office. Nearly every British newspaper, London and Provincial, has published the true facts of the case. A glance at the *Aëronautical Journal* for April last would have revealed Dr. Barton's own paper on the subject, read before the members of the Aëronautical Society of Great Britain in March last. Though, in this book, accounts and criticisms of M. Santos Dumont's experiments are sparse, pictorial illustrations of the famous Brazilian aëronaut's aircraft are largely employed to enhance the make-up of the volume. M. Santos Dumont forms the subject of illustration for the outside cover, for the frontispiece, and on several pages of the book. There will soon be a market for works on aëronautics, but they must be lucid and sound if they are to enhance the popularity of the subject.

Foreign Aëronautical Periodicals.

(In this list a selection of some of the more notable articles is given.)

L'Aéronaute (Paris).

July, 1902.—Rapport sur le Duquesne, Ballon à hélices de L'amiral Labrousse.

August.—Rapport de M. Cassé sur L'aérostat automobile de M. Josselin; Mémoire sur le propulseur Bataille.

L'Aérophile (Paris).

July, 1902.—Portraits d'Aéronautes contemporains: François Hulka (Louis Cermák); Ascension Tragique (Henri Gaspard); La perméabilité nasale observée en ballon Dr. Consteau); La Volateur de M. Schmatz (Georges Blanchet).

September.—Portraits d'Aéronautes contemporains: Emile Janets (Wilfrid de Fonvielle); Rapport sur un mémoire de M. Torres, concernant un avant-projet de ballon dirigéable (Appell); Le ballon du Capitaine Unge (G. Blanchet).

L'Aéronautique.—Bulletin officiel de L'Aéronautique: Club de France (No. 2.); La Sécurité en ballon à moteur (M. Ed. Surcouf).

Illustrirte Aëronautische Mittheilungen (Strassburg).

July, 1902.—Die Entwickelung der Luftschiffahrt in Deutschland (paper read before the Aëronautical Society of Great Britain, March 11, 1902;) Wie verhält sich de Drachenballon bei einer Freifahrt? (A. Riedinger); zur Berechnung der Steighöhe eines Fesselballons; Blitzschlag in einen Fesselballons; Die Katastrophe des "Pax" am 12 Mai; Theoretische Grundlagen für die Construction eines Schraubenfliegers (Dr. O. Martleussen).

WIENER LUFTSCHIFFER-ZEITUNG (VIENNA).

August, 1892.—Ballons in der Marine; Grundzüge der praktischen Luftshiffahrt (Victor Silbur); Carton Uber Severo.

September.—Von Augsburg nach Russland; Zur Frage der Flugflächenform; Der Wettbewerb in St. Louis.

THE AËRONAUTICAL WORLD (Glenville, U.S.A).

August.—The Conquest of the Air by Man; The Fallacy of Balloons; A Simple Aërial Machine; The Aërial Transit of Man; Leo Stevens's Airship.

September.—Practical Flying Machines; The Stanley Airship; Irish's Aërial Machines; Motorless and Motor-driven Aërial Machines; Hargreaves' Flying Machine; The Art of Flight.

Notable Articles.

July, 1902.

16. *Daily Mail.*—"Child's Balloon Journey."
— *English Mechanic.*—"The Future of the Flying Machine."

Aug. 12. *Edinburgh Evening Dispatch.*—"Experiments in Kite Flying."
— *Daily Chronicle.*—"Crossing the Channel."
20. *Electricity.*—"Professor Bell's Flying Machine."
26. *Pall Mall Gazette.*—"Santos Dumont and the St. Louis Exhibition."
— *New York Herald.*—"Perilous Balloon Ascent."
29. *New York Herald.*—"M. Santos Dumont's coming Airship."
30. *Daily Graphic.*—"The Graphic Balloon."

Sep. 1. *Daily Graphic.*—"Strategic Ballooning."
— *Standard.*—"Balloons in Warfare."
5. *New York Herald.*—"Trying to conquer the Aërial World."
13. *Times.*—"By Sky across the Irish Channel," letter to the Editor by Rev. John M. Bacon.
20. *Daily Telegraph.*—"Airship across London."
22. *Times.*—"The Airship Journey across London."

Applications for Patents.

(*Made in July, August and September*, 1902).

The following list of Applications for Patents connected with Aëronautics has been specially Compiled for the AËRONAUTICAL JOURNAL by Messrs. BROMHEAD & Co., Patent Agents, 33, Cannon Street, London, E.C.

14405. June 25. FREDERICK MALFAIT. **Improvements in Navigable Balloons.**

15403. July 10. EMILE NÉMETHY. **Improvements in Flying Machines.**

16698. July 28. DONAT SAMPSON. **Improvements in Flying Machines.**

17068. August 1. EDWARD MANN and CHARLES ARTHUR ROLLASON. **Improvements in and connected with Flying Machines and Dirigible Balloons.**

17252. August 5. EMIL THEODOR BRAARUP. **Improved means of Inflating Indiarubber Balloons.**

17286. August 6. ANTON WECZERA and LEWIS WELLS BROADWELL. **Improvements in Flying Machines.**

17383. August 7. JOHN NEVIL MASKELYNE and JOHN MACKENZIE BACON. **Improvements in Hot Air Balloons.**

17499. August 8. SIDNEY JOHN LAWRENCE. **Improved Air-Ship.**

17661. August 12. RAFFAELE RONCO. **Improvements in Steering Devices for Air-Ships and Submarine Boats.**

17844. August 14. FREDERICK WILLIAM BISHOP. **Improvements in or in connection with Navigable or other suitable Balloons.**

18248. August 19. JOHN SIGISEMAN RYAN. **An improved Flying Machine.**

18453. August 22. ANNIE LOUISE VEALE, CLEMENT PEARCE CADLE, RICHARD PELFORD, and ADDISON BRIGHT EVANS. **A Parachute used as a Toy or as a Moving Target for Sportsmen.**

19137. September 1. A. STANNARD CUBITT. **Automatically Releasing Apparatus for use with Kites, Captive Balloons and the like.**

AERONAUTICAL SOCIETY OF GREAT BRITAIN.

FOUNDED 1866.

PRESIDENT - MAJOR BADEN-POWELL, SCOTS GUARDS.

COUNCIL, 1902.

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The Society is established for the purpose of giving a stronger impulse to the Scientific study of Aërial Navigation; to promote the intercourse of those interested in the subject at home as well as abroad; and to aid with advice and instruction those studying the subject.

Any person desirous of becoming a member is requested to communicate with the Hon. Secretary, on the form of application as overleaf.

P.T.O.

*Christian and Surname*_____

*Rank or Profession*_____

*Address*_____

_____

*Date*_____ 19

SIR,

Please to propose my name as a Member of the Aëronautical Society of Great Britain.

If elected, I undertake to pay the subscription of One Guinea per annum (unless I shall give previous notice of withdrawal), or to compound for my annual subscriptions by the payment of Ten Guineas, and to abide by the Rules of the Society.

*(Signature)*_____

To ERIC STUART BRUCE, ESQ.,

Hon. Sec. Aëronautical Society,

19, CAMPDEN HOUSE ROAD, KENSINGTON LONDON, W.